

WHAT IS CLAIMED IS:

1. A low vision viewing apparatus that displays an image of an object, said apparatus comprising:

a camera, including a lens to define an image plane and an electronic image sensor located at the image plane for capturing a visual field;

a display means;

an electronic processing means controlled by a program, connected intermediate of said display means and said camera, which defines said visual field as a set of pixels and a subset of said set of pixels as a window-of-interest; and

a steering means to select said subset of pixels on said visual field which constitutes the window-of-interest.

2. A low vision viewing apparatus according to claim 1 wherein:

said electronic processing means includes storage means; and

said electronic processing means controlled by said program that causes said processing means to apply digital magnification to said stored set of pixels to a desired magnification level selected by said low-vision user, said electronic processing means displaying a magnified image of said visual field image on said display means.

3. A low vision viewing apparatus according to claim 2 wherein said electronic image sensor is a high-resolution image sensor that captures a high-resolution image.

4. A low vision viewing apparatus according to either of claims 1 or 2 wherein said electronic image sensor is a low-resolution image sensor that captures a plurality of low-resolution images by moving a low-resolution image sensor by sub-pixel amounts and combining said low-resolution images to create a high-resolution image.

5. A low vision viewing apparatus according to either of claims 1 or 2 wherein said electronic image sensor consists of a plurality of low-resolution image sensors that are optically "buted" together to create a single high-resolution image sensor and captures a high-resolution image.

6. A low vision viewing apparatus according to either of claims 1 or 2 wherein said electronic image sensor is a low-resolution image sensor that is moved within said image plane of said lens to capture a plurality of low-resolution images, and combining said low-resolution images to create a high-resolution image.

7. A low vision viewing apparatus according to any one of claims 3 to 6 wherein said electronic processing means moves said window-of-interest on said electronic image sensor by reading said subset of pixels from said electronic image sensor and displaying said window-of-interest on said display means.

5 8. A low vision viewing apparatus according to any one of claims 3 to 6 wherein said electronic processing means moves said electronic image sensor within said image plane of said lens and displays said window-of-interest on said display means.

9. A low vision viewing apparatus according to any one of claims 3 to 6 wherein said electronic processing means moves said electronic image sensor within said
10 image plane of said lens and displays said high resolution image on said display means.

10. A low vision viewing apparatus according any one of claims 7 to 9 wherein said low-vision user controls the location of said window-of-interest or said electronic image sensor by a device selected from the group consisting of a trackball, a joystick,
15 a set of buttons, a mouse, a touch screen, or a touch tablet.

11. A low vision viewing apparatus according to any one of claims 1 to 10 wherein said electronic processing means subsamples said window-of-interest by reading said subset of pixels as defined by a previously defined regular pattern and displays a compressed image on said display means.

20 12. A low vision viewing apparatus according to any one of claims 3 to 6 or 9 wherein said electronic processing means subsamples said high-resolution image by reading said set of pixels as defined by a previously defined regular pattern and displays said compressed image on said display means.

13. A low vision viewing apparatus according to claim 12 wherein said program
25 controls said processing means to apply digital magnification to said high-resolution compressed image to a desired magnification level selected by said low-vision user and displays the digitally magnified image on said display means.

14. A low vision viewing apparatus according to any one of claims 7, 8 or 10 wherein said program controls said processing means to apply digital magnification to
30 said window-of-interest to a desired magnification level selected by said low-vision user and displays the digitally magnified image on said display means.

15. A low vision viewing apparatus according to claim 11 wherein said program controls said processing means to apply digital magnification to window-of-interest compressed image to a desired magnification level selected by said low-vision user and displays the digitally magnified image on said display means.

5 16. A low vision viewing apparatus according to either of claims 12 or 13 wherein said program controls said processing means to select said high-resolution compressed image based on said desired level of magnification selected by said low-vision user, and displays selected image on said display means.

10 17. A low vision viewing apparatus according to any one of claims 7, 8, 10 or 14 wherein said program controls said processing means to select said window-of-interest based on said desired level of magnification selected by said low-vision user, and displays selected image on said display means.

15 18. A low vision viewing apparatus according to either of claims 11 or 15 wherein said program controls said processing means to select said window-of-interest compressed image based on said desired level of magnification selected by said low-vision user, and displays selected image on said display means.

19 A low vision viewing apparatus according to any one of claims 13 to 18 wherein said program controls said processing means to select said desired magnification level for each letter so that text in said visual field and said window-of-
20 interest is magnified to a preselected size on said display means.

20. A low vision viewing apparatus according to any one of claims 13 to 18 wherein said program controls said processing means to select said desired magnification level for each letter so that the text in said visual field and said window-of-interest is reduced to a preselected size on said display means.

25 21. A low vision viewing apparatus according to any one of claims 13 to 15 wherein said digital magnification is implemented using two dimensional scaling by a form of interpolation selected from the group consisting of linear interpolation, nearest-neighbour interpolation, or cubic spline interpolation.

30 22. A low vision viewing apparatus according to any one of claims 12, 13 or 16 wherein said program controls said processing means to automatically adjust the brightness and contrast of said high-resolution compressed image on said display

means.

23. A low vision viewing apparatus according to either of claims 7, 8, 10, 14 or 17 wherein said program controls said processing means to automatically adjust the brightness and contrast of said window-of-interest on said display means.

5 24. A low vision viewing apparatus according to any one of claims 11, 15 or 18 wherein said program controls said processing means to automatically adjust the brightness and contrast of said window-of-interest compressed image on said display.

25. A low vision viewing apparatus according to claim 2 wherein said electronic processing and storage means successively adjusts the focus of said lens and captures
10 an image at different focus points, analyses said different focused images to extract the image sections of each different focus image which are the sharpest, and combines said image sections to yield a high-resolution image with extended depth of focus.

26. A low vision viewing apparatus according to any one of claims 3 to 7 or 9 wherein said program controls said processing means to implement pixel level
15 binarisation on said stored high-resolution image based on a uniform pixel threshold level.

27. A low vision viewing apparatus according to any one of claims 3 to 7 or 9 wherein said program controls said processing means to implement pixel level binarisation based on a pixel threshold level which varies over said high-resolution
20 image to provide optimum binarisation in the presence of brightness variations.

28. A low vision viewing apparatus according to any one of claims 3 to 6 wherein said program controls said processing means to use page segmentation to identify the location of letters and a reading order for said letters in said stored high-resolution text and display said letters on said display means in a predefined pattern.

25 29. A low vision viewing apparatus according to claim 28 wherein said program controls said processing means to arrange said letters into words and displays said words on said display means in a predetermined sequence wherein each said word replaces the previous said word after a predetermined time period.

30. A low vision viewing apparatus according to claim 28 wherein said program
30 controls said processing means to arrange words on said display means in a predetermined sequence, wherein said words are displayed from one side of said

display means to the opposite side of said display means.

31. A low vision viewing apparatus according to any one of claims 28 to 30 wherein said program controls said processing means to separate said letters by displaying said letters with a predetermined space between each said letter.

5 32. A low vision viewing apparatus according to any one of claims 28 to 31 wherein said program uses a device to determine the section of said stored high-resolution image text displayed on said display means by a device from the group consisting of a trackball, a joystick, a set of buttons, a mouse, a touch screen, or a touch tablet.

10 33. A low vision viewing apparatus according to any one of claims 3 to 6 wherein said program automatically moves through said stored high-resolution image text, said movement based on said reading order of said text on said display means.

34. A low vision viewing apparatus that magnifies and displays an image of an object on a display means, said apparatus incorporating a controller for electronically
15 processing said image, said electronic processing modes including:

a live video capture and image display of said magnified image; and
a static image capture and image display of said magnified image.

35. A low vision viewing apparatus according to claim 34 wherein said static image capture mode allows a user to adjust the magnification of said static image on said
20 display means.

36. A low vision viewing apparatus according to either of claims 34 or 35 wherein said static image capture mode allows the user to navigate said static image on said display means.

37. A low vision viewing apparatus according to any one of claims 34 to 36
25 wherein said static image capture mode analyses text present in said static image and provides for the display of said text on said display means in a plurality of predetermined formats.

38. A low vision viewing apparatus according to any one of claims 34 to 37
30 wherein said static image capture mode analyses the reading order of said text, and facilitates the user to navigate around said static image on said display means by using a controller to determine the section of said static image to be displayed on said

display means.

39. A low vision viewing apparatus according to any one of claims 34 to 38 wherein said static image capture mode analyses the reading order of said text and allows automatic movement of the section of said static image visible on said display
5 means, using a controller to determine the speed and direction of said automatic movement.

40. A low vision viewing apparatus as herein described with reference to Figures 2 to 8.